Figure 1a

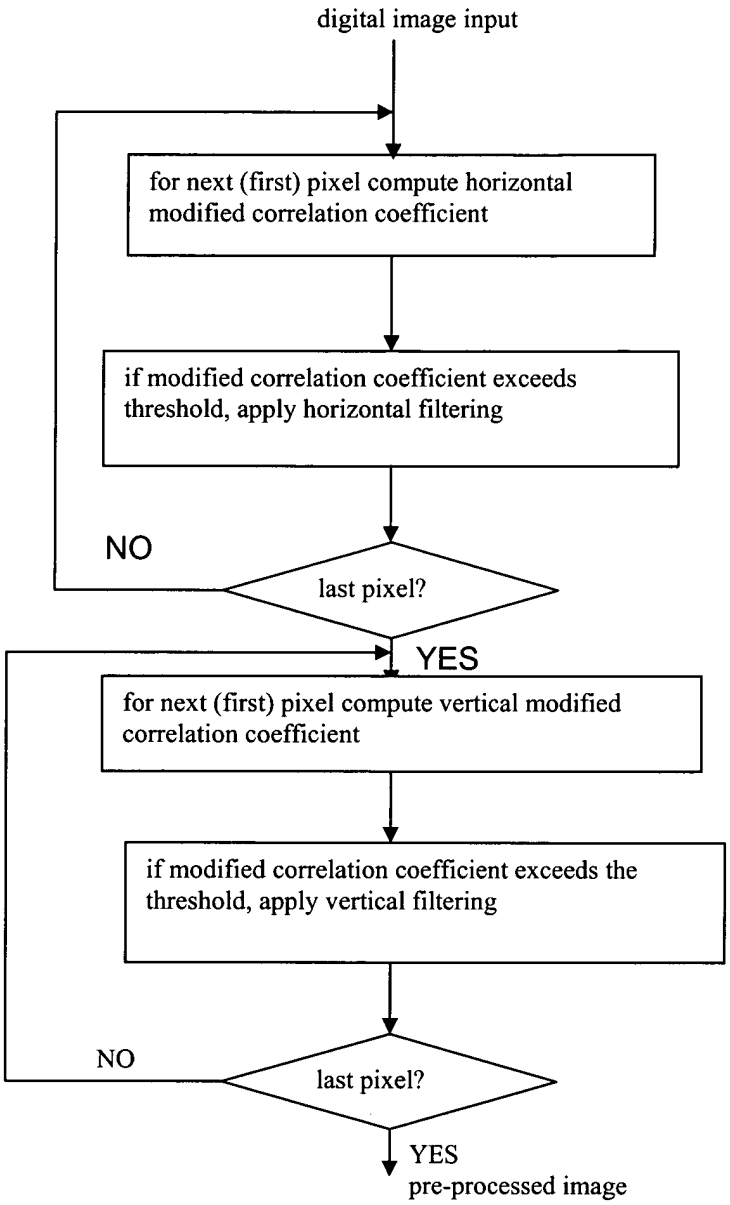
digital image input
for next (first) pixel compute horizontal modified correlation coefficient
if modified correlation coefficient exceeds threshold, apply horizontal filtering
NO
last pixel?
YES
for next (first) pixel compute vertical modified correlation coefficient
if modified correlation coefficient exceeds the threshold, apply vertical filtering
NO
last pixel?
YES
pre-processed image

Figure 1b

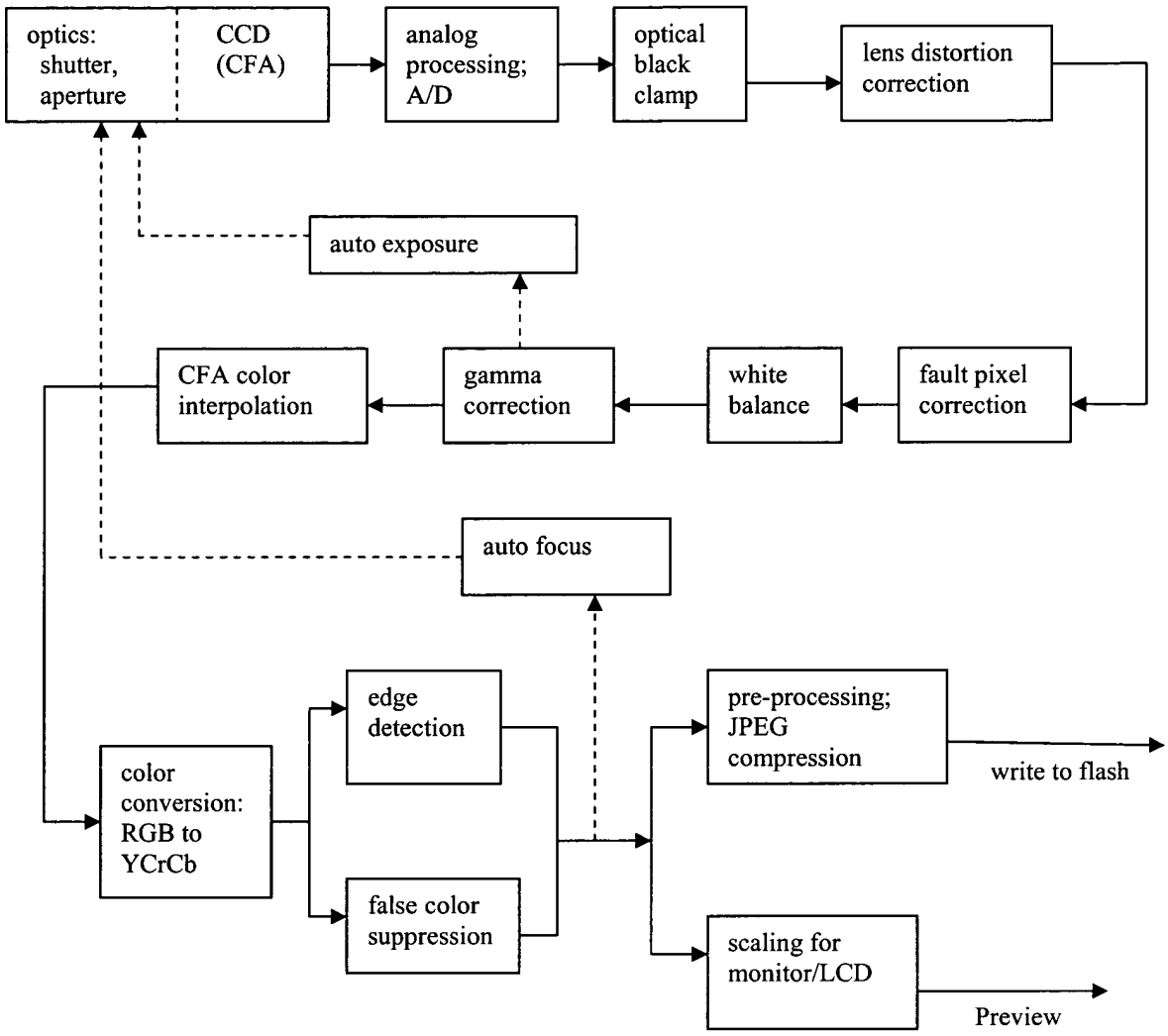
optics: shutter, aperture
CCD (CFA)
analog processing; A/D
optical black clamp
lens distortion correction
auto exposure
CFA color interpolation
gamma correction
white balance
fault pixel correction
auto focus
edge detection
color conversion: RGB to YCrCb
false color suppression
pre-processing; JPEG compression
write to flash
scaling for monitor/LCD
Preview

Figure 2a. Original image. a: spatial frequency is low. b: spatial frequency is modest. c: spatial frequency is high.

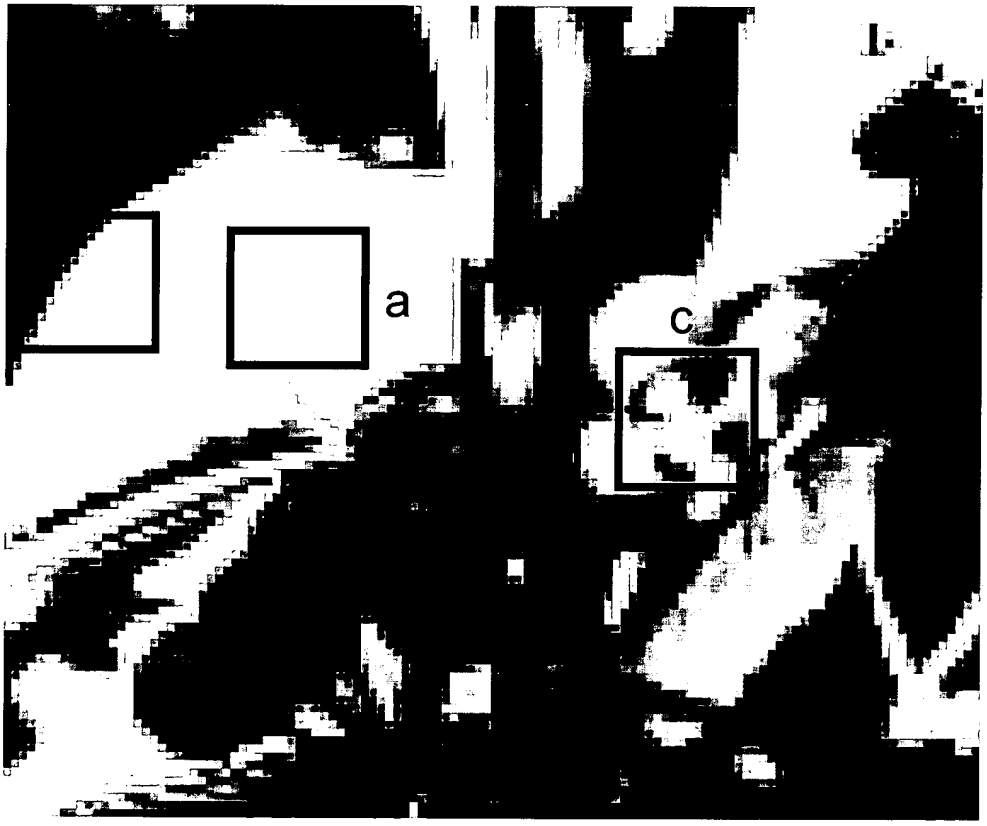

Figure 2b. JPEG compressed image of figure 1. a: distortion is small. b: distortion is annoyingly large. c: distortion exists but it is not noticeable.

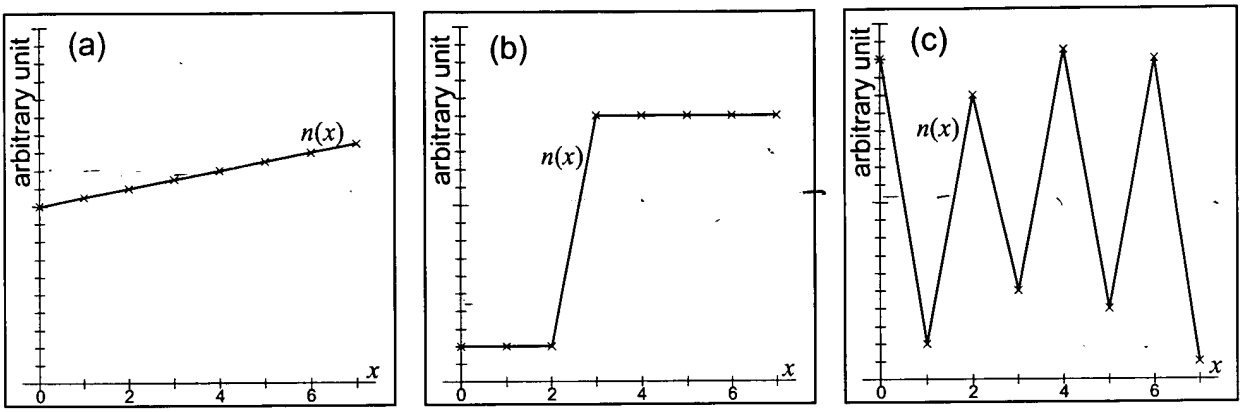

Figure 3. Schematic drawing of signal patterns ($n(x)$) with various frequency distributions.

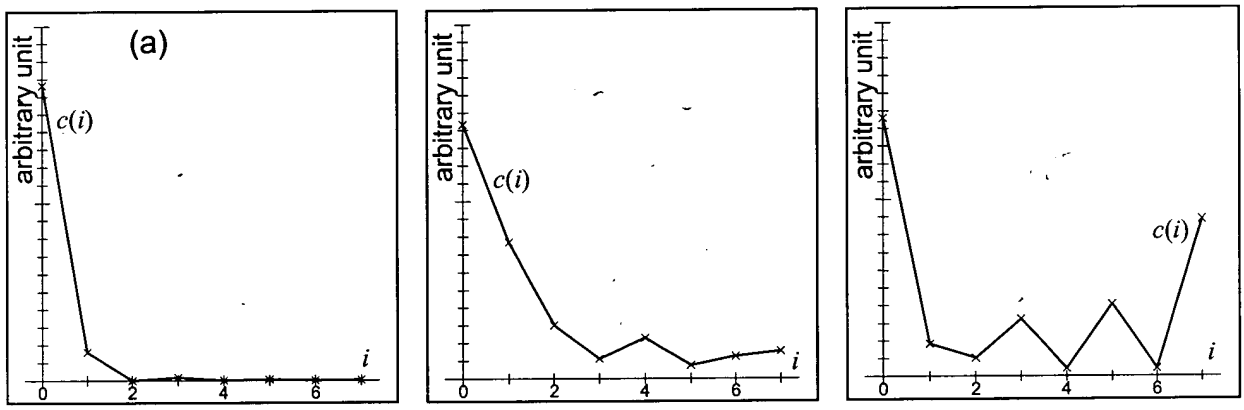

Figure 4. DCT coefficient ($c(i)$) of the signal patterns in figure 3, correspondingly. (a) DCT coefficients mainly exist in low frequency region. (b) DCT coefficients gradually degrade from low frequency to high frequency. (c) DCT coefficients is large in high frequency region.

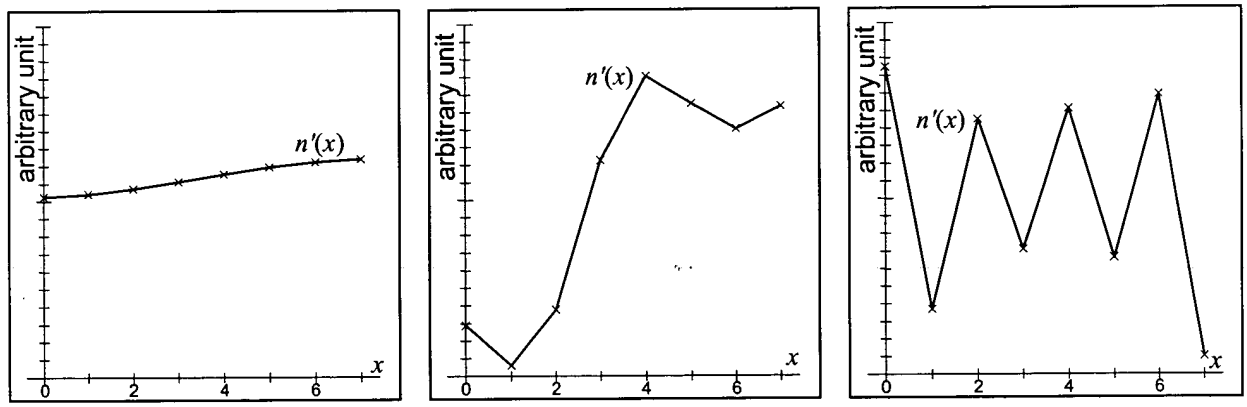

Figure 5. Reverse DCT of signals in figure 4 after quantization. (a) distortion is small. (b) Distortion caused by quantization is obvious around the edge. (c) Distortion exists, but it is not perceivable for human eyes.

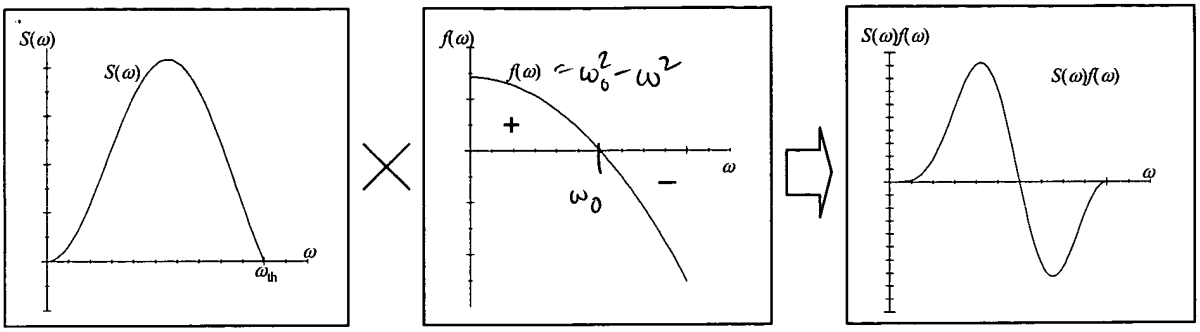

Figure 6. An explanation on the introduced metrics *I*. The power spectrum is multiplied with an arbitrary function, with positive value near 0, and negative value in high frequency region.

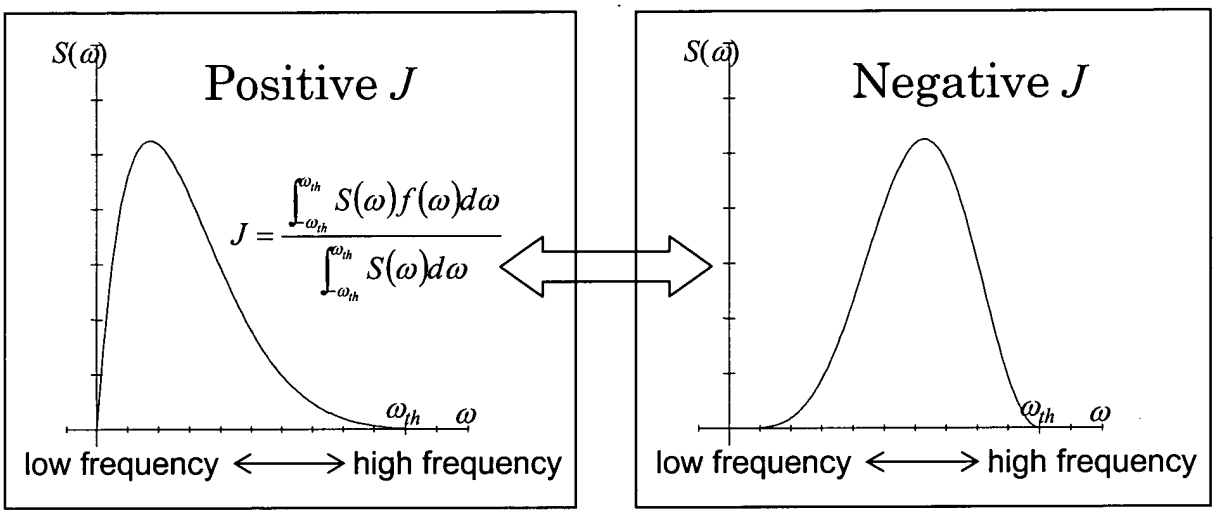

Figure 7. An example of the introduced metric *J*. If the power spectrum distribution lies mainly in low frequency region, the metric *J* will be positive. If the spectrum distribution lies in high frequency region, *J* will be negative.

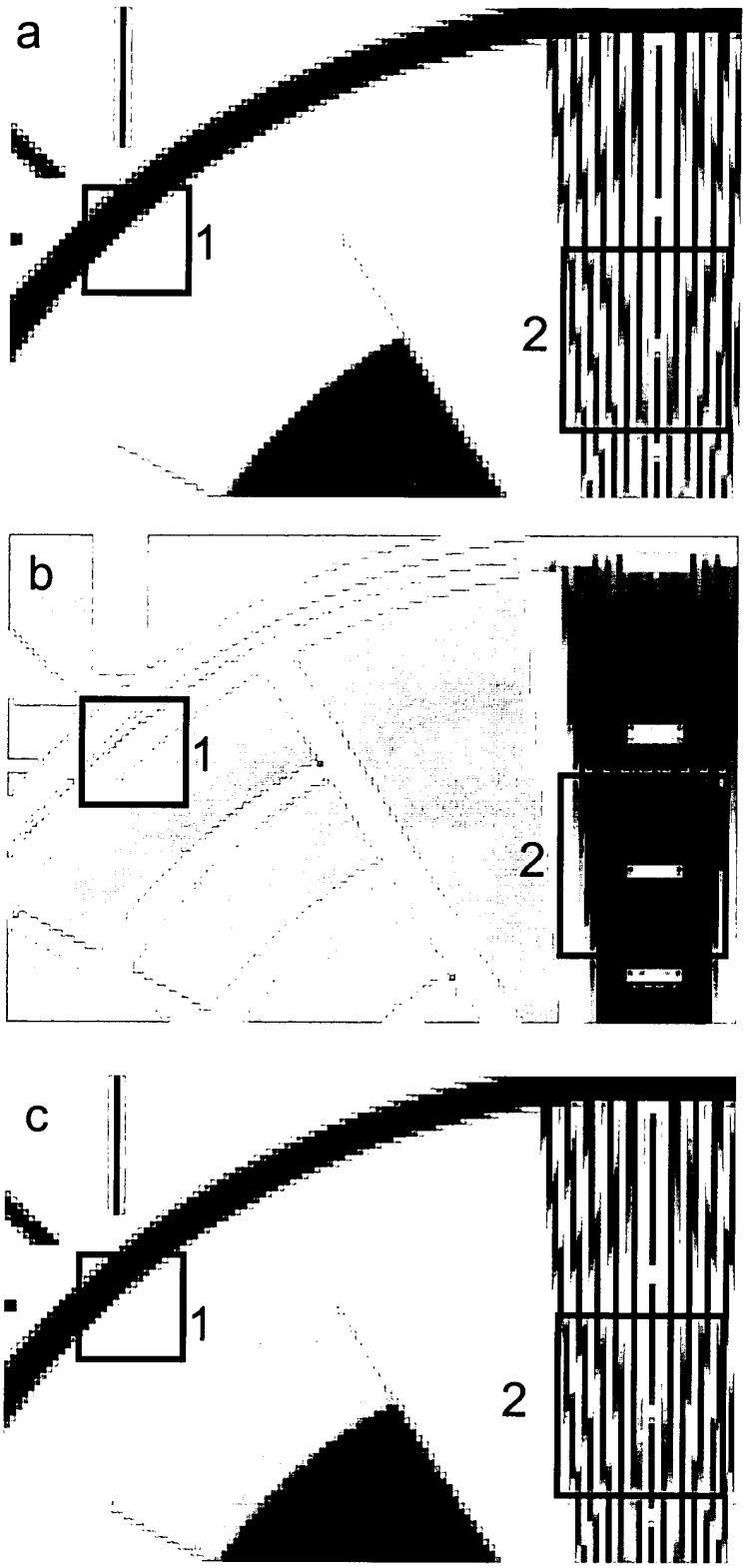

Figure 8. (a) test pattern. (b) distribution of ρ. ρ is computed for 9 pixels horizontally. DC component is removed before computation of ρ. If power spectrum is constant 0 in that region, ρ is set to be zero. Large (positive) ρ is painted white and small (negative) ρ painted dark. ρ is large at boundaries between white plane and dark plane, at which distortion is large in DCT-based compression. Box 1 shows such example. Please note that, ρ is very low in stripe pattern, unlike conventional edge detection technique. (c) JPEG compressed image of a. Notice that distortion is most visible where ρ is large in b.

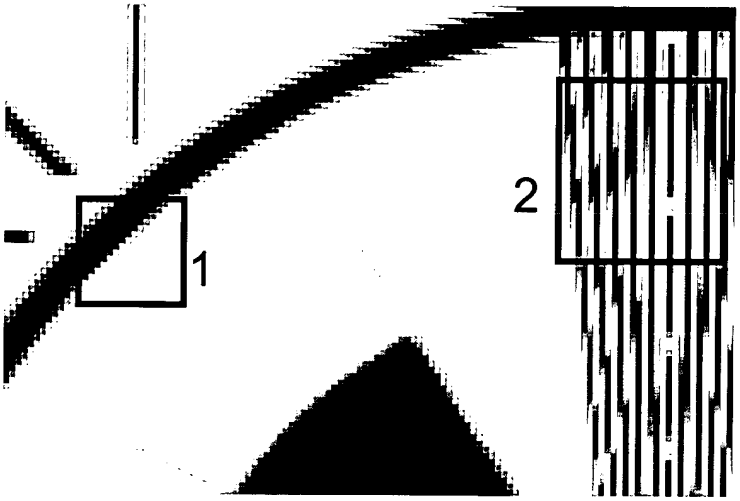

Figure 9. JPEG compressed image of test pattern in figure 8, after filtering with preferred embodiment method. In box 1, the distortion is much smaller compared to figure 8c. On the other hand, clarity in stripe pattern (box 2) is not deteriorated.

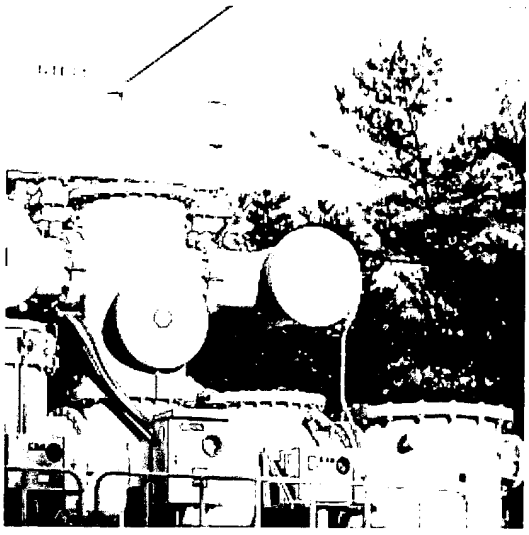

Figure 10. Test pattern for filtering.

Figure 11. JPEG compressed image of figure 10, without filtering. Artifacts caused by compression are obvious near solid edges.

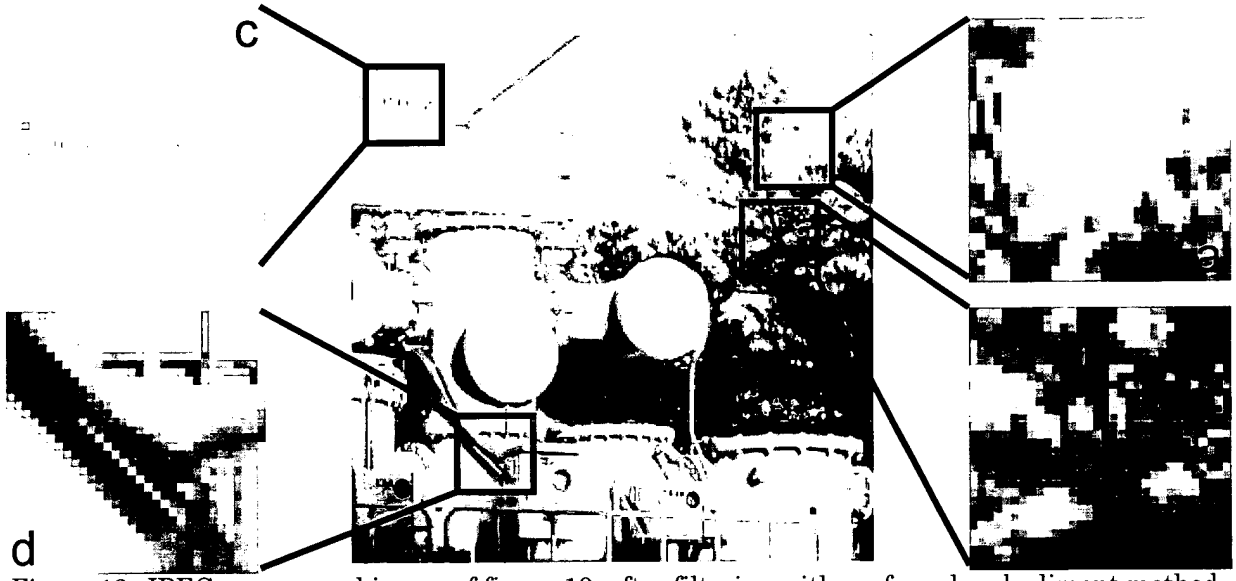

Figure 12. JPEG compressed image of figure 10, after filtering with preferred embodiment method. Artifacts are suppressed compared to figure 11. Note the clarity in detail, in comparison to figure 13.

Figure 13. JPEG compressed image of figure 10, after filtering with conventional method. Although, the artifacts are suppressed the details have been blurred out.